

## **AMENDMENTS TO THE CLAIMS**

Please amend the claims as follows:

Please cancel claim 1.

### **Listing of claims.**

Claims 1-9 (cancelled)

10. (New) A thin film magnetic memory device, comprising:

a memory array having a plurality of memory cells arranged in a matrix, for magnetically storing data, wherein

each of said memory cells has a magnetic storage portion for storing data when being magnetized in one of two directions,

said thin film magnetic memory device further comprising:

a program circuit for storing information for use in at least one of data read operation and data write operation from and to said plurality of memory cells, wherein

said program circuit includes a plurality of program units for storing program data of said information when the program unit is in a program state,

each of said program units includes two program cells that are magnetized in one of two directions, and

when said program unit is in said program state, one of said two program cells in said program unit is magnetized in a direction different from that in a non-program state.

11. (New) The thin film magnetic memory device according to claim 10, wherein each of said magnetic storage portions and each of said program cells have a same structure,

when the program unit is in said non-program state, said two program cells in said program unit are magnetized in a same direction, and

a magnetization direction of said magnetic storage portions in an initial state is the same as that of said program cells in said non-program state.

12. (New) The thin film magnetic memory device according to claim 10, wherein the two magnetization directions of said magnetic storage portions and said program cells are respectively set along an easy axis specific to said magnetic storage portions and an easy axis specific to said program cells, and said magnetic storage portions and said program cells are arranged so that said respective easy axes thereof extend in a same direction.

13. (New) The thin film magnetic memory device according to claim 10, wherein each of said magnetic storage portions and each of said program cells include a first magnetic layer magnetized in a fixed direction, a second magnetic layer magnetized either in a same direction as, or in an opposite direction to, that of said first magnetic layer depending on storage data, and an insulating film formed between said first and second magnetic layers, and in each of the program cells in said non-program state and each of the magnetic storage portions in said initial state, said first and second magnetic layers are magnetized in a same direction.

14. (New) The thin film magnetic memory device according to claim 13, wherein a step of magnetizing said magnetic storage portions to said initial state and a step of said magnetizing each program cells to said non-program state are conducted simultaneously.

15. (New) The thin film magnetic memory device according to claim 10, wherein said memory array further includes redundant circuits provided respectively corresponding to prescribed blocks of said plurality of memory cells, each for replacing the prescribed block including a defective memory cell, and said information stored in said program circuit includes a defective address for specifying the prescribed block including said defective memory cell, said thin film magnetic memory device further comprising: a redundant control circuit for controlling access to said redundant circuits based on a comparison result between an address signal for selecting said prescribed blocks and said

defective address stored in said program circuit.

16. (New) The thin film magnetic memory device according to claim 15, wherein when said defective address is selected by said address signal, said redundant control circuit provides an instruction to access said redundant circuits and an instruction to discontinue access to a prescribed block corresponding to said address signal.

17. (New) The thin film magnetic memory device according to claim 15, further comprising:  
a monitor terminal for outputting an electric signal according to said comparison result in said redundant control circuit.

18. (New) The thin film magnetic memory device according to claim 10, wherein each of said program cells has first and second electric resistances respectively corresponding to said two magnetization directions,  
each of said program units further includes current sensing circuits provided respectively corresponding to said program cells,

in program data read operation from said program cells, each of said current sensing circuits applies a bias voltage to the corresponding program cell and outputs a binary voltage signal according to a current flowing through said corresponding program cell by said bias voltage,

each of said program units further includes a logic gate for outputting a first program signal, said first program signal indicating whether said program unit is in said program state or said non-program state according to a level of said binary voltage signal output from said current sensing circuits, and

each of said program units outputs one of said binary voltage signals respectively output from said current sensing circuits as a second program signal indicating a level of said program data.

19. (New) The thin film magnetic memory device according to claim 18, wherein each of said current sensing circuits applies said bias voltage to both a reference resistor

having an electric resistance equal to an intermediate value of said first and second electric resistances and the corresponding program cell, and amplifies a difference between currents flowing through said reference resistor and said corresponding program cell and outputs said binary voltage signal.

20. (New) The thin film magnetic memory device according to claim 10, wherein a bias voltage applied to each of said program cells in program data read operation from said program cells is lower than a voltage applied to each of said magnetic storage portions in normal data read operation.

21. (New) The thin film magnetic memory device according to claim 10, wherein a period during which a bias voltage is applied to each of said program cells in program data read operation from said program cells is shorter than that during which a voltage is applied to each magnetic storage portion in normal data read operation.

22. (New) The thin film magnetic memory device according to claim 10, wherein in program data read operation, each program unit outputs a first program signal and a second program signal according to the magnetization directions of corresponding two program cells, said first program signal indicating whether said program unit is in said program state or said non-program state, and said second program signal indicating a level of said program data, said program circuit further includes data latch circuits provided respectively corresponding to said program units, for holding said first and second program signals output from corresponding one of said program units,

said program data read operation is conducted in response to power-ON of said thin film magnetic memory device, and

said data latch circuits hold said first and second program signals from power-ON until power-OFF of said thin film magnetic memory device.

23. (New) The thin film magnetic memory device according to claim 10, wherein when the program unit is in said non-program state, said program cells in said program unit are magnetized in a same direction,

each program cell is magnetized by a first program magnetic field of a hard-axis direction and a second program magnetic field of an easy-axis direction,

said program circuit further includes

a program selection line shared by said two program cells of a same program unit, for receiving a first program current for generating said first program magnetic field, and

first and second program data lines provided respectively corresponding to said two program cells, for receiving a second program current for generating said second program magnetic field, and

said second program current is applied to said first and second program data lines in opposite directions.

24. (New) The thin film magnetic memory device according to claim 23, wherein said program circuit further includes

a voltage setting portion for connecting one end of said first program data line to one of first and second voltages and connecting one end of said second program data line to the other voltage according to a level of said program data, and

a program data line connection portion for electrically coupling the other ends of said first and second program data lines at least in said program data write operation.

25. (New) The thin film magnetic memory device according to claim 23, wherein each of said magnetic storage portions is magnetized by a first data write magnetic field of a hard-axis direction a second data write magnetic field of an easy-axis direction, and

each of said magnetic storage portions and each of said program cells have a same structure and same magnetic characteristics,

said thin film magnetic memory device further comprising:

a plurality of write selection lines provided respectively corresponding to memory cell rows, for receiving a first data write current for generating said first data write magnetic field in a selected row;

a plurality of write data lines provided respectively corresponding to memory cell columns, for receiving a second data write current for generating said second data write magnetic field in a selected column; and

a current supply circuit for supplying a prescribed current to a write selection line of said selected row as said first data write current, wherein

said current supply circuit supplies said prescribed current to said program selection line as said first program current in said program data write operation.

26. (New) The thin film magnetic memory device according to claim 23, wherein each of said magnetic storage portions is magnetized by a first data write magnetic field of a hard-axis direction a second data write magnetic field of an easy-axis direction, and said magnetic storage portions and said program cells have a same structure and same magnetic characteristics,  
said thin film magnetic memory device further comprising:  
a plurality of write selection lines provided respectively corresponding to memory cell rows, for receiving a first data write current for generating said first data write magnetic field in a selected row;  
a plurality of write data lines provided respectively corresponding to memory cell columns, for receiving a second data write current for generating said second data write magnetic field in a selected column; and  
a current supply circuit for supplying a prescribed current to a write data line of said selected column as said second data write current, said prescribed current having a direction according to write data, wherein  
said current supply circuit supplies said prescribed current to said program data lines as said second program current in said program data write operation.

27. (New) The thin film magnetic memory device according to claim 10, wherein each of said program cells includes a plurality of series-connected magneto-resistance elements, and  
each of said magneto-resistance elements have a same structure and same magnetic characteristics as those of each of said magnetic storage portions.

28. (New) A thin film magnetic memory device, comprising:  
a memory array having a plurality of memory cells for magnetically storing data, wherein each of said memory cells has a magnetic storage portion for storing data when being magnetized in one of two directions,

said thin film magnetic memory device further comprising:  
a program circuit for storing information for use in operation of said thin film magnetic memory device, wherein  
said program circuit includes  
a program element for magnetically storing program data of said information,  
a sensing circuit for reading said program data from said program element in response to power-ON of said thin film magnetic memory device, and  
a data latch circuit for holding said program data read by said sensing circuit until power-OFF of said thin film magnetic memory device.

29. (New) A thin film magnetic memory device, comprising:  
a memory array having a plurality of memory cells each magnetically storing one-bit data, wherein  
each of said memory cells has a magneto-resistance element whose electric resistance varies when said magneto-resistance element is magnetized in a direction according to said data,  
said thin film magnetic memory device further comprising:  
a plurality of program registers each storing a one-bit program signal for use in programming of information used in operation of said thin film magnetic memory device, wherein  
each program register includes  
a plurality of program elements each having an electric resistance varying according to a magnetization direction thereof, and  
a sensing circuit for reading a corresponding one-bit program signal according to a difference in electric resistance between said plurality of program elements, and  
the number of said program elements included in each of said program registers is greater than that of said magneto-resistance elements used in each of said memory cells to store one-bit data.

30. (New) The thin film magnetic memory device according to claim 29, wherein  
each of said program elements and each of said magneto-resistance elements include  
a first magnetic layer magnetized in a fixed direction,  
a second magnetic layer magnetized either in a same direction as, or an opposite direction to, that of said first magnetic layer depending on said data and said program signal to be

stored, respectively, and

an insulating film formed between said first and second magnetic layers, wherein a difference between voltages applied to said first and second magnetic layers of each of said program elements upon reading said program signal is greater than that between voltages applied to said first and second magnetic layers of each of said magneto-resistance elements upon reading said data.

31. (New) The thin film magnetic memory device according to claim 29, wherein each pair of program registers forms a program unit for storing one-bit program data, and said one-bit program signal stored in one program register of said pair of program registers indicates whether said program unit is in a non-program state or a program state.

32. (New) A thin film magnetic memory device, comprising:  
a memory array having a plurality of memory cells for magnetically storing data, wherein each of said memory cells includes a magneto-resistance element having either a first electric resistance or a second electric resistance higher than said first electric resistance when being magnetized in a direction according to said data,

said thin film magnetic memory device further comprising:

a plurality of program registers each storing a one-bit program signal for use in programming of information used in operation of said thin film magnetic memory device, wherein

each of said program registers includes a plurality of program elements each having an electric resistance varying according to a magnetization direction thereof,

each of said program elements has either a third electric resistance lower than said first electric resistance or a fourth electric resistance higher than said third electric resistance according to said one-bit program signal stored therein, and

a ratio between said first and second electric resistances is equal to that between said third and fourth electric resistances.

33. (New) The thin film magnetic memory device according to claim 32, wherein each of said program elements and each of said magneto-resistance elements includes  
a first magnetic layer magnetized in a fixed direction,  
a second magnetic layer magnetized either in a same direction as, or an opposite



direction to, that of said first magnetic layer depending on said data and said program signal to be stored, and

an insulating film formed between said first and second magnetic layers, wherein a current passage area in said first and second magnetic layers and said insulating

layer upon reading said program signal from each of said program elements is greater than that in said first and second magnetic layers and said insulating layer upon reading said data from each of said magneto-resistance elements.